



Connectors for Industrial Robotics Applications

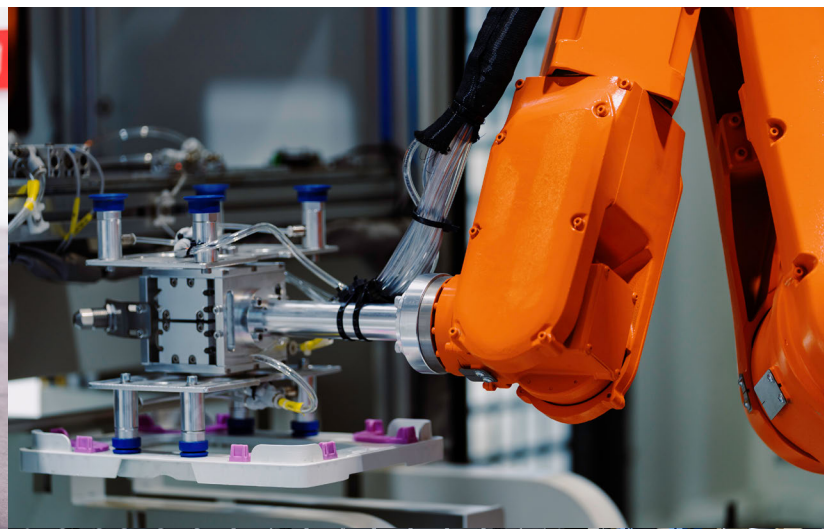
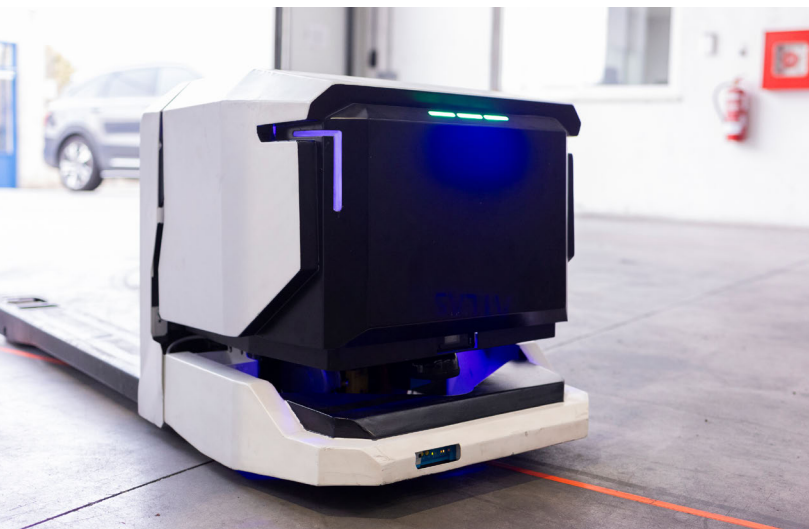


• APTIV •

Aptiv is a global technology company that enables a safer, greener and more connected future with scalable hardware and software solutions.

Our **Connection Systems** business offers a full range of connectivity products for power and data applications.

The portfolio includes low- and high-voltage connectors for conditions ranging from light duty to harsh environments, as well as high-speed data connectors that support increasing bandwidth requirements.



Aptiv Connection Systems

PIONEERING MODERN CONNECTIVITY SOLUTIONS

Global Excellence in Connectivity

Aptiv Connection Systems stands at the forefront of electrical and electronic connectivity innovation, delivering premium connection systems that consistently exceed global customer expectations. Our cutting-edge technologies and processes are shaped by deep customer insights and a relentless pursuit of innovation. We remain dedicated to collaborating with partners to develop connectivity solutions that meet the increasingly demanding quality and performance standards in today's market sectors.

Advanced Manufacturing & Design Capabilities

Using state-of-the-art manufacturing technologies and comprehensive design services, we create high-performance, cost-efficient connection systems available as both off-the-shelf and custom solutions. Our end-to-end approach encompasses the design, manufacturing, assembly, validation and delivery of electrical/electronic connectivity products that satisfy the most stringent industry requirements.

Versatile Solutions Portfolio

Our diverse product lineup spans from signal-level to high-power connection systems, featuring both unsealed and sealed, ergonomically designed connections for inline, device and header applications. Our comprehensive offerings position Aptiv as a trusted single-source connectivity partner.

Market Applications

Aptiv Connection Systems delivers specialized connectivity solutions across several sectors:

- **Agricultural equipment**
- **Automotive**
- **Construction machinery**
- **Energy market and power applications**
- **Industrial and robotics applications**
- **Marine applications**
- **Mass transit systems**
- **Medium- and heavy-duty trucks**
- **Motorcycle technology**
- **Recreational vehicles**
- **Urban air mobility (eVTOL)**

The Aptiv Difference

Comprehensive Product Ecosystem

An extensive range of connectivity solutions

Pioneering Interconnect Technologies

At the cutting edge of the industry

Cross-Industry Expertise

Deep knowledge across multiple connector applications

A Holistic Systems Approach

Integrated solutions rather than isolated components

Customer-Centric Innovation

Solutions developed around real client needs

Exceptional Service Standards

Consistently exceeding customer expectations

A Robust Global Presence

Seamless support across international markets

Connector Series for Low Voltage Applications



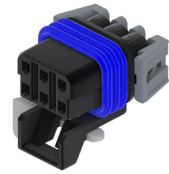
NANOPACK™ CTS

Miniaturized connectors engineered for reliability in compact electronic applications



CTS 1.2 SEALED

Sealed connection system delivering compact, reliable performance for harsh operating environments



METRI-PACK™

Standard connection for heavy-duty performance, up to 20G vibration, 125°C and high-pressure spray

CONNECTOR & TERMINAL RANGE

- | | | |
|---|--|--|
| <ul style="list-style-type: none">• 0.5 mm Series• 2-way to 24-way configurations• Inline, headers, mixed and device• 105 °C maximum temperature• IP67 and IPx9K sealed or unsealed• 90° left/right or 180° covers (sealed)• Sn or Ag plating | <ul style="list-style-type: none">• 1.2 mm Series• 2-way to 6-way configurations• Inline and device• 18.7A maximum current• 175 °C maximum temperature• Cable-sealed• Sn or Ag plating | <ul style="list-style-type: none">• 150, 280, 480, 630, and 800 Series• 1-way to 16-way configurations• Inline, headers, and mixed• Maximum current: 14A (150 Series) up to 60A (800 Series)• 125 °C maximum temperature• Cable-sealed• Sn, Ag, and Au plating |
|---|--|--|

FEATURES & BENEFITS

- | | | |
|---|--|---|
| <ul style="list-style-type: none">• Heavy-duty performance• Ergonomic design• Robust contact geometry• Designed for high temperatures and vibration profiles• Independent Secondary Lock (ISL) to detect partially installed terminals• Best-in-class lock overstress protection• Designed for automated harness assembly• CPA (Connector Position Assurance) optional | <ul style="list-style-type: none">• Short shroud design for small packaging footprint and long shroud design for easy mating device• One-piece molded housing ensures best-in-class sealing performance• Increased sealing performance through a unique three-rib robust seal design (175 °C version)• Patented Smart Locking System version of the CPA prevents unmating in high vibration environments• Compatible with wire dress back shells | <ul style="list-style-type: none">• The comprehensive product range supports design flexibility and application versatility• Supports both high-current and low-energy circuits for maximum electrical adaptability• Robust terminals assure correct alignment and connection integrity• Connector Position Assurance (CPA) and Terminal Position Assurance (TPA) provide superior connection reliability• Environmental sealing provides exceptional protection against temperature extremes, chemicals and abrasion |
|---|--|---|

TYPICAL APPLICATIONS

- | | | |
|---|--|---|
| <ul style="list-style-type: none">• Safety systems• Vision sensors• Navigation systems• CAN bus system | <ul style="list-style-type: none">• Control modules• PLC• Lighting systems• Proximity sensors | <ul style="list-style-type: none">• Battery packs• Traction motor sensors• CAN bus systems• Actuator signals |
|---|--|---|

Connector Series for Low Voltage Applications



OCS 1.5 SEALED

Full inline and device connector series designed for improved reliability and a variety of uses across industries



APEX™ 2.8 SEALED

Ergonomic design and heavy-duty performance to withstand heat, vibration and moisture in harsh conditions



HES

Circular connectors engineered for uncompromising performance in extreme environments

CONNECTOR & TERMINAL RANGE

- 2-way to 16-way, female and male
- Six standard indexes
- Primary lock reinforcement (PLR)
- CPA available
- 21A continuous maximum current rating
- -40 °C to +125 °C operating temperature range
- IP69K-rated sealing

- 2-way to 14-way configurations
- Inline and device
- 40A maximum current
- 150 °C maximum temperature
- Mat-sealed; IP68-rated

- 24 shell connectors
- Six terminal patterns
- Standard/reverse configurations
- Thin wall, regular wall and heavy wall
- 19 mm, 22 mm and 25 mm conduit adapters, straight and right angle
- 50-way to 60-way header system
- Pin/sleeve terminals compatible with MIL 390329 industry standard cavity
- Ni or Au plating

FEATURES & BENEFITS

- Compatibility with industry standard mating interfaces
- Robust reliability and designed-in durability
- Housing lock overstress protection to prevent lock relaxation or damage
- Polyester resins for an enhanced audible click, to improve operator build feedback and dimensional stability in all seasons
- Optimized PLR for improved terminal unseat detection
- Cavity designed with a positive forward stop to prevent terminal push-through
- Optimized optional CPA that provides additional lock performance to ensure connectors stay mated

- Industry's most compact 2.8 mm system
- Fully protected interface seal
- PLR and CPA to ensure connection integrity
- Mechanical polarization to eliminate mismates
- Proven environmental sealing in harsh environments

- Three-rib seal design for up to 57% higher performance
- Up to 44% higher terminal retention while reducing plugging force
- Validated to SAE J2030
- HES terminals for improved electrical performance
- Ergonomic harness assembly
- Assembly benefits: lock window and alignment arrows; color-coordinated seals

TYPICAL APPLICATIONS

- Battery packs
- Ultrasonic sensors
- Motor feedback controls
- Steering and braking

- Temperature, proximity and torque sensors
- Lift motors
- Battery and related connections
- CAN bus systems

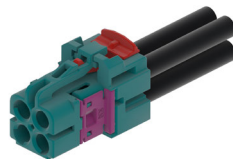
- ECU - main control outboard clusters
- Service modules
- Emergency stop system
- Safety systems and sensors

Connector Series for High Speed Data Applications



HIGH SPEED FAKRA (HSF)

Supporting multigigabit data rates and power over coax for a simpler design



MINI COAX

Supporting higher data rates up to 15 GHz as next-generation of high-speed FAKRA



AMEC

Auto Mateable Modular Ethernet Connector can scale from 100 Mbps to 1 Gbps within the same footprint



AMEC™-H (H-MTD®)

Next generation networking applications that support 2-wire data transmission interconnects

PRODUCT SPECIFICATIONS

- | | | | |
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| <ul style="list-style-type: none"> • Up to 6 GHz • Temperature range: -40 °C - 105 °C • Vibration level: V1 • Up to 2A maximum DC current • Up to class 3-rated sealed and unsealed | <ul style="list-style-type: none"> • 9 GHz up to 15 GHz • Temperature range: -40 °C - 105 °C • Vibration level: V1 • Up to 2A maximum DC current • Up to class 3-rated sealed and unsealed | <ul style="list-style-type: none"> • Up to 100 Mbps and 1 Gbps • Ethernet ports 1-8 • Inline and header connections • 050 components • Modular concept • Broad portfolio • UTP and STP cable • Mixed connectors | <ul style="list-style-type: none"> • 1 Gbps to 56 Gbps • Up to 20 GHz • Impedance: 100Ω • Return loss: ≥ 30dB, DC to 1 GHz • Power current: ≤ 1.5A DC • Temperature range: -40 °C - 105 °C • Channel Specification IEEE 802.3bp and IEEE 802.3ch • 1-way to 6-way configurations • Cable-sealed |
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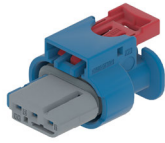
FEATURES & BENEFITS

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| <ul style="list-style-type: none"> • Stamped and formed terminal • FAKRA II interface • Wide variety of coax cables • Highest mechanical robustness • Serviceable designs • PCB connectors: SMD pin-in-paste soldering types | <ul style="list-style-type: none"> • Compact and reliable high-speed system offers up to 80% reduction in package size • Flexible design to support multiple connector variants • Proprietary outer crimp over braid design for improved mechanical strength and RF performance • Robust locking surface for improved terminal-to-cavity retention • Optional Connector Position Assurance (CPA) • Robust multiple key codes | <ul style="list-style-type: none"> • Outstanding performance for differential pair signal transmission • Stable performance across various temperatures and frequencies • Automated cable assembly process • Serviceable design • Anti-stubbing technology • Wide range of cable types • Secondary locks on terminals/housings • Ethernet protocols: Open Alliance and IEEE 802.3 | <ul style="list-style-type: none"> • Fully shielded 2-wire data connectivity solution • Outstanding performance for differential pair signal transmission • Interface, PCB and cavity compatible to Rosenberger H-MTD® • Optional CPA • Optimized insertion force with improved retention force • Indexes A-D and Z |
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TYPICAL APPLICATIONS

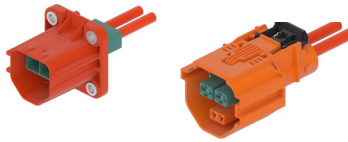
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| <ul style="list-style-type: none"> • Antennas • GPS • Sensors • Telematics | <ul style="list-style-type: none"> • ADAS cameras • Smart sensors and modules • Power over coax • Radar • Supports autonomous driving applications | <ul style="list-style-type: none"> • Cameras • Antennas • Smart sensors and modules • Industrial ethernet | <ul style="list-style-type: none"> • Radar • Lidar • ECU • Industrial ethernet • Supports autonomous driving applications |
|--|---|---|--|

Connector Series for Power Applications



48V CONNECTORS

Broad portfolio of 48V connectors for up to 60V with proven, robust terminal systems to avoid intermittent contacts



SHIELDPACK™ HV630

The largest global portfolio of auxiliary module connections, rated up to 1000V



POWERPACK LV1000

High current carrying capacity, a proven terminal system and a compact design

PRODUCT RANGE

- LVCS 0.64 and 2.8 Series
- CMC 0.64 V0 Series
- CTS 1.2 SensoMate® Series
- Apex 2.8 Sealed Series
- CTS 9.5 Sealed Series
- DCS 9.5 Power Sealed/4.8 Series
- Mixed CTS 9.5 and Apex 1.2 Series
- PowerPack LV 1000 and 2000 Connectors
- PowerPack 48V Sealed Ring Connectors
- Wire-to-device
- Cable exit orientation: 180°
- Temperature range: -40 °C - 125 °C
- 60A maximum current
- 1000V maximum DC voltage
- Electrical protection: IP2XB
- IP67 / IP6K9K-rated sealing
- Vibration level: V1
- Inline, device and pass-through applications
- 1-way and 2-way configurations
- Straight and right-angle versions
- 120A continuous maximum current rating
- 48V maximum DC voltage
- Temperature range: -40 °C to +125 °C
- IP67 / IP6K9K-rated sealing
- Unshielded
- Vibration level: V2

FEATURES & BENEFITS

- Industry standard interfaces are supported
- Connectors withstand high vibration levels and operating temperatures
- Connectors meet IEC creepage and clearance standards up to 60V
- A terminal secondary lock eliminates terminal pushout risk
- Sealed connectors mitigate risk of electrochemical corrosion
- Inner connector with TPA can be plugged into header during device assembly (on wire-to-device)
- Tool-less unmating systems
- Finger proof/touch safe
- Panel mount to device with face seal
- Aluminum compression bushings
- ISO cable compatible
- Secondary terminal locking
- High current carrying capacity
- Proven terminal system
- Compact system design
- Field-proven in heavy duty applications
- Silver-plated multi-contact terminal system
- Sealed panel-mount pre-stages prior to fastening
- Panel-mount secured in place with self-tapping screws
- Pass-through connection accepts both straight and right-angle connectors

TYPICAL APPLICATIONS

- Motor and drivetrain connections
- Lighting applications
- Battery connections
- Sensor and actuator connections
- DC-to-DC converter
- Battery packs
- On-board charger
- Auxiliary loads
- Battery packs
- Power inverters
- Electric motors
- Power distribution unit (PDU)

Robotics Application Guide

ROBOTIC ARM

FAKRA



AMEC-H



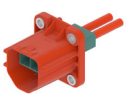
MINI COAX



Navigation

- Cameras
- Laser scanners
- Vision systems
- Industrial ethernet
- Proximity sensors

HV630



48V



POWERPACK



Power systems

- Electric motors
- Actuators
- Controllers

APEX



CTS 1.2



NANOPACK CTS



HES



Electrical systems

- Electronic control module
- LCD display
- Temperature and force sensors
- CAN bus

Robotics Application Guide

AGV/AMR

HV630



48V



POWERPACK



Power systems

- Battery connections
- HV PDU
- Electric motors
- Power inlets

FAKRA



MINI COAX



Navigation

- Cameras
- Laser scanners
- Radar and lidar

OCS



CTS 1.2



NANOPACK
CTS



HES



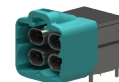
Electrical systems

- ECU
- PLC
- Control module
- Fuse box
- LCD display

AMEC



AMEC-H

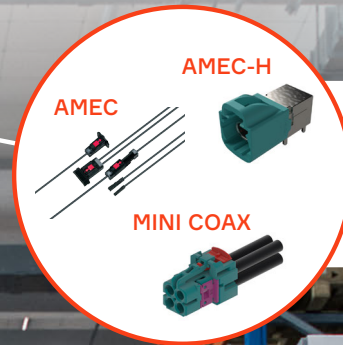


Safety

- Anti-collision strip
- Proximity sensors
- Emergency stop

Robotics Application Guide

HUMANOID



- Navigation
- Cameras
 - Radar
 - Lidar



- Power systems
- Battery pack
 - 48V connection
 - Power management



- Electrical systems
- Torque motors
 - Sensors
 - Control modules
 - Actuators

Notes



For More Information

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